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ABSTRACT

This collection of five papers provides guidance and background reading for librarians in the use of films, educational television, audiolearning, programmed learning, and visual learning in the presentation of library instruction programs. The instructional media discussed in each guide are intended to complement and supplement oral classroom and library tour instruction on library usage. Each paper includes an overview of the subject matter, research and related reports, a summary and conclusions of the material presented, and a bibliography. (RAA)

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ACADEMIC LIBRARY INSTRUCTION

The Use of Films
The Use of Educational Television
The Use of Audiolearning
The Use of Programmed Learning
The Use of Visual Learning Material

by

Don W. McNeil

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ACADEMIC LIBRARY INSTRUCTION

The Use of Films

By

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INTRODUCTION

Most librarians agree that instruction in library usage is most acutely needed. A problem, however, is to decide which method of instruction should be used: group or individual? Both methods are being used, and both have been successful and both have been unsuccessful. Some librarians have sought to evade a decision by employing a combination of the two. And yet, recognizing the need for instruction in the use of the library, the subject must be taught somehow.

Films are widely used by librarians for the instruction of library usage. A review of the literature reveals the use of motion picture film, of filmstrips, of slides, and of microfilm.

The development of a well-designed library instruction program involves the completion of three important steps: construction, implementation, and evaluation. Each of these steps is integral to the preceding or subsequent step, and together, these three steps form the nucleus for a thorough and complete instruction program.

If we assume that a given library instruction program is well-designed, such a belief leaves unanswered any question challenging the validity of films as a teaching tool. This paper reviews a selection of research studies, both comparative and attitudinal, investigating that very question. If a library elects to use film to carry the library instruction program, can the librarian be assured of the value of film as an instructional method as compared to more traditional teaching approaches?

FILM: AN OVERVIEW

All types of photographic films are included by the term instructional film when used for teaching purposes: motion pictures, slides, filmstrips, microfilm, and transparencies. Although they have certain common attributes, instructional films do vary in their physical characteristics. Light is transmitted through visual images printed on a transparent acetate base. The images are enlarged by the projected light upon a screen. Each scene in motion picture projections follow the other rapidly in sequential linear order. On the other hand, the still picture projection may be kept in view for an unspecified length of time. (2)

16 MM

In the AV field the 16mm motion picture medium has so dominated the audiovisual concept that the teams "16mm" and "audiovisual" have been almost synonymous. Too, more is probably known about the 16mm than any of the other film medium.

The nontheatrical film medium — basically 16mm — really began in 1923 when 16mm film was introduced. Before 1923, some 35mm film was used in schools and even more in churches. That film system, however which used the highly inflammable nitrate base stock, was not only a fire hazard but had the additional handicap of lack of portability because of the bulky, heavy 35mm projectors. (24)

Developmental work on a safety-base acetate film stock began in 1906. It was first manufactured in 1912 by the Eastman Kodak Company. A number of people and companies envisioned use of motion pictures by amateurs as a home movie system potentially comparable to the hobby of still photography. (24)

The first safety base film was ordered from Kodak in 1912 by Thomas Edison, who developed a 22mm projector and camera — the Edison Home Kinetoscope. That same year, Pathe Freres, a French firm, introduced a 28mm film system. The film provided for both systems used a negative from which positive prints were made. (24)

Meanwhile Eastman Kodak people studied the capability of the existing film emulsions and determined that an area 1/6 the size of the 35mm frame could be projected on a moderately small screen without too much grain showing. That 1/6 is a 16mm frame. (24)

Previous explorations into a smaller (then called substandard) film included 17.5mm, 21mm, 15mm, 11mm and even 5mm. These efforts took place in London, Paris, Dresden, New York City, East Orange, N.J., Chicago, Rochester, N.Y., and Davenport, Iowa. In the latter city, A. F. Victor tried a spiral film disc in 1911! (24)

On January 1, 1923, Eastman Kodak introduced 16mm acetate safety base film to the world. It abandoned the negative-print system for a new reversal film in which the camera film became the final positive print for projection. (24)

While the lantern slide (3¼" x 4"), the stereopticon picture card and the blackboard were in use earlier, 1923 is the year most often noted as the beginning of audiovisual media. (24)

Sound-on-film for 35mm was introduced in 1927-28. Two years later the RCA Corporation brought out a 16mm sound projector in cooperation with Eastman Kodak, which designed a film with perforations along one side only, leaving the other side available for a photographic (optical) sound track. (24)

Although color was added to 16mm in 1928 (called Kodacolar, but different from today's Kodacolor), it was the introduction of Kodachrome in 1936 that truly started the long swing to color over the following 25 years. (24)

Historically, one other development should be cited. Eastman Kodak brought out the famous Cine Special camera in the early 1930s as an advanced amateur product, with tooling intended to last for three years only. The camera stayed on the market for about 20 years. A whole business — the nontheatrical film field — grew up around that camera, much as the DC3 airplane served as the stimulus for the young airline industry. The 16mm system remains the principal production medium for industrial films, educational subjects, documentaries, television commercials and now even some theatrical feature films. (24)

In its first 20 years the 16mm nontheatrical film made modest progress. But it was the heavy use of military training in World War II which gave the motion picture medium the real lift it needed. Right after the war ended, the film medium exploded. (24)

Sales of 16mm sound projectors in 1948 reached 58,300, the highest annual total until 1966 when sales jumped to 75,000 units. Meanwhile 8mm — later to become super 8 — and videotape recording joined the AV media list to give 16mm some real competition. (24)

Today the 16mm film is, defacto, the predominant motion medium in the world. Altogether, there are about 500,000 projectors in use in American schools. The fact that the schools own probably 5,000,000 16mm prints makes it difficult for any new medium to capture any significant portion of the educational market. (24)

Super 8/8 MM

The history of 8mm, first introduced in 1932, goes back almost as far as that of 16mm film. Of course, 8mm began as an amateur product for the general public. In the early 1950s the idea of adding sound on 8mm film intrigued AV users. They envisioned a low-cost, easy-to-use motion picture system for schools, churches, training and commerce. (27)

In 1952, Lloyd Thompson, the engineering talent of The Calvin Company, Kansas City, Mo., an early 16mm film producer, designed an 8mm sound projector using a phonographic disc. Although 1,500 units were sold, the system was apparently ahead of its time. (27)

Eastman Kodak engineers built a prototype 8mm sound projector about 1950 that was never manufactured. Then in the mid 1950s a number of business AV users urged various manufacturers to come up with a sound-on-film 8mm projector. Sherman Fairchild's Fairchild Camera and Instrument Co. had similar ideas. Technicolor saw a market for a convenient continuous loop projector for amateurs to show their home movies without having to rewind the film. Eastman Kodak took another crack at it. (27)

In 1960 all three companies introduced 8mm projectors. Fairchild's and Kodak's were sound models using a magnetic stripe outside of the perforations on the film. Technicolor's was a silent version. (27)

Both Kodak and a 16mm engineering genius, John Maurer, felt that the traditional 8mm frame wasted area on the film. Also, the quality of the sound could be improved by moving the track to the other side of the film as it is on 16mm film. Maurer's design would increase the picture size by 20%, Kodak's by 49%. In the end, the Kodak design was adopted by the industry and it was named super 8. The new standard was introduced in 1965. (27)

A number of companies in the United States and abroad joined the bandwagon. As a result half a dozen different designs were brought out, some using loop cartridges for easy loading and continuous running of the film. Kodak and Bell & howell in their respective models used a cartridge for automatic threading, but the film went onto a reel and then rewound back into the cartridge, all automatically.* (27)

8mm was heralded as an exciting new medium, not as bulky as 16mm and potentially much less expensive. With a plethora, however, of super 8 sound projectors and several silent styles, none compatible with another, the excitement over 8mm as a new medium turned to confusion on the part of the potential users. (27)

*Cassette and cartridge have different meanings in film, audio and video media. This "cartridge" has the same function as video "cassette."

The Technicolor silent loop projector, intended for the amateur market, failed, but then caught the eye of educators who saw it as a good instructional tool. Short film segments could be applied in "single concept" use by classes and by students doing independent study. (27)

Filmstrip

One of the oldest of all modern-day media is the filmstrip. It currently ranks third in annual dollar investment for audiovisual communications purposes. In aggregate more filmstrip projectors — 4,500,000 — have been sold over a 55-year period than any other medium. (9)

Today the filmstrip projector continues to lead all AV systems in actual use. In terms of software 22,000 filmstrips have been produced for educational purposes in just the past seven years. The great majority have been sound and, in the last year or two, less than 1% have been silent releases. (9)

Of the principal media in common use today, the filmstrip ranks as second oldest. While the motion picture is actually older, film in 16mm form did not appear on the scene until 1923. (9)

The early history of the filmstrip is hazy. The first reference to the 35mm filmstrip appears in 1914. It is not clear who deserves credit for inventing the filmstrip projector. Many names are identified with the medium. John R. Bray's "Brayco" filmstrip projector is purported to have been brought out in 1923. (9)

An earlier reference to a "slidefilm" projector dates back to 1914. The New York optical firm of Herbert and Huesgen demonstrated the "Tourist Multiple Camera" which made a series of pictures on a 35mm strip of film. Little mention is made of using the film except that a positive print was shown in a special projector for still pictures. (9)

A third early projector carries the names of two men, Maurice G. Ricker and Morton A. Bassett. The patent specifications for their machine were witnessed on Dec. 24, 1914, while the patent was actually filed on Jan. 8, 1915. There is no further information about their projector. (9)

Another noteworthy name is certainly the best known today. Jamison Handy conceived the idea for using still pictures in place of motion pictures around 1910 or 1911. (9)

Mr. Handy liked the silent filmstrip idea which provided the opportunity for classroom dialogue. Teacher and students alike could stop the filmstrip at any time and talk back and forth. He called it "talking pictures." Hollywood later picked up the term for sound films. (4)

Handy's backer was Harley Clarke, an electric power mogul in Chicago, who was later to become co-founder of the Society for Visual Education — SVE as it is known today. Mr. Handy was not aware of any other slidefilm projectors at the time he had three machinists in Chicago develop his projector, the "Explainer." (9)

It was not until about 1918 that he had a slidefilm projector ready. He recalls that in 1919 he showed it to John Bray, who was a client of his for travel films which Handy had produced. (9)

Bray asked Handy if he, Handy, could have some machines ready before Christmas to be sold as toys. Bray wanted the machine to sell for $25. Handy's model was $49 with 26 slidefilms. Today Jam Handy remembers his first order of 1,000 projectors from Clarke in 1920. That minimum production run was uncommitted at the time and Handy placed the order on faith. It was not until 1925 that he made his first fleet sale (1,000 units) to the Chevrolet Division of General Motors. That company was looking for a dramatic tool for its dealer channels in combating its biggest rival, the Ford. (9)

In the 25 years between 1915 and 1940 Hope Reports can trace sales of about 22,000 silent projectors. Sales during World War II were modest, chiefly to the military. In the last half of the 1940s, however, sales exploded and output jumped from a few thousand to 40,000 per year. (9)

In the 1950s annual sales of silent projectors averaged 78,000. During the 1960s sales climbed to 117,000 per year. For the first half of the 1970s annual sales rode up at the rate of 226,000. (9)

Sales peaked in the early 1970s and have declined for the past three years. They are expected to continue dropping as the sound filmstrip system takes over. (9)

Sound was synchronized with a filmstrip in 1931. A sound filmstrip projector came into the market in 1936. Sales were minimal prior to World War II. In 1942 an order of 200 projectors sold to none other than The Jam Handy Organization of Detroit was recalled by the DuKane Company of St. Charles, Illinois, to fill an order from the Pentagon. All output for the next three years went to the military. (9)

2" x 2" Slide

Most versatile of all media in use today is probably the 2" x 2" slide. This 40-year-old system is one of two media popular with consumer and professional users alike (the other being the super 8 medium). Since 1935 an estimated 14 million 2" x 2" slide projectors have been sold to consumers and audiovisual customers. (28)

Today the consumer and AV 2" x 2" slide system makes up an annual business of $650 million, with AV accounting for 12%. Of the total, probably a quarter comes from projector sales, 24% from camera sales, 40% from film and processing and 1% from sales of prepared slide sets. (28)

In the past few years projector sales in the consumer market have leveled off, while those in the AV markets have been climbing steadily. Industry estimates place units currently in use within the consumer field at 8 million. It is estimated that there are close to 1 million being used in the AV markets. (28)

The glass lantern slide (3¼" x 4") was the first true slide system, the forerunner of the 2" x 2" slide. Use of 35mm film for still pictures originated from an adaption of the 35mm movie projector. Stil projection was devised by stopping a movie projector and dropping a filter slide (often called the "gold dust" slide) into the aperture to protect the highly flammable nitrate movie film from the heat of the projection lamp. The filter slide contained iron filings which dispersed the heat. (28)

It was not, however, until 1936-1937 that actual 2" x 2" slides were first used. In 1935 the Eastman Kodak Co. introduced Kodachrome film for 16mm movie making. The following year Kodachrome (on safety-base film) came out in 35mm for still pictures. A new medium was born! (28)

The quality of early 35mm film did not impress AV specialists and other professionals who continued to depend upon the lantern slide for major presentations until the mid 1950's. By that time 35mm color film emulsions had been improved to the point where a 35mm image could be projected to a 60-foot width. (28)

Early consumer use of the slide projector centered on what is still its principal application: personal documentation of trips and family events. A few business firms were among the early users of 35mm slides. (28)

Educational users of the slide, however, came about slowly. A 1936 survey of school AV equipment indicated that 50% of private and public el-hi schools were without electricity. Many of the filmstrip projectors, which were finding acceptance in schools, included an adapter which allowed 2" x 2" slides to be fed by hand one at a time. (28)

In 1961 a breakthrough occurred. In that year Kodak introduced the round-tray concept with its Carousel projector line and projector sales took a sharp upward turn that year. (28)

Among six silent 2" x 2" slide projector systems one dominates — the Eastman Kodak horizontal round-tray system (Carousel and Ektagraphic). Others are GAF's (Sawyer) vertical round-tray system and Spindler and Sauppe's horizontal round tray and belt. Two-thirds of all professional slide projector models, sound and silent, on the market today, tuilize the Kodak system. (28)

In recent years sound has been added to the 2" x 2" slide system. There are now a dozen incompatible systems. Most of the sound-slide systems, however, use the standard Philips audio cassette. (28)

Two media are easiest to produce — audio cassettes and 2" x 2" slides. Equipment is plentiful in both cases. With little technical training an individual can make a slide or an audio cassette of high quality. (28)

It is the ease of producing slides which makes the medium highly popular. Effective slides can be among the most powerful of all media. From a dollar standpoint the slide is the most cost effective of all media. (28)

Overhead

While a relatively new medium, less is known about overhead projector sales and equipment population than most other products. Sales have been strong, although over the past five years they have been 35% under those of the preceding five years. (22)

In the 30-year life of the large aperture overhead projector, an estimated 2.5 million units have been sold. Schools and colleges now have about three-quarter million projectors in use. (22)

The overhead projector is a first cousin of the opaque projector which has been in use since 1936. The latter has the drawback of needing a totally darkened room. Conversely the overhead is extremely efficient and can be used in a moderate level of ambient light. High intensity projectors will even perform in daylight. (22)

The first overhead projector used a 3¼" x 4" slide on a flat stage. In 1944 H. G. FitzGerald of Victorlight Industries, Inc. developed the "Identicast" for police identification work. Six cellophane rolls, each with a different facial feature, moved across a round 9"-diameter stage to develop various faces. Another model was designed for keeping bowling scores. Scribe Visualizer, also of California, was unsuccessful in marketing an overhead projector using a parabola lens and a chrome-plated reflector. (22)

Victorlight designed the VisualCast, a large classroom overhead projector (known as the "monster") first used by the U.S. Army. In 1945-46 a New York City dealer asked the Charles Beseler Co., which made 3¼"-4" overhead projectors, to design one with a round 8" diameter stage. That became the well-known Vu-Graph. (22)

Today's models have a square image area 10" x 10". The light source has been improved as lamp technology has brought higher intensity with cooler operation. These developments plus manufacturing simplifications have actually brought the price down for the typical unit. (22)

In the early days overhead transparencies were principally custom-made by each user. Production required expensive and sophisticated processing equipment. The advent of the small office copying machine brought about a new era. Users could quickly and easily make transparencies in black-and-white or in color. (22)

Educational producers began to develop transparency sets similar to slides but with embellishments. Transparencies could have a series of overlays to build up a map or a gasoline engine, for example. Sales soared in the mid '60s but in the '70s have tapered off as the 2" x 2" slide and filmstrip have caught on. (22)

Many overhead transparencies are sold as a part of multimedia kits which are one of the fastest growing of all media in the past five years. (22)

RESEARCH REPORTS

In this paper, we review a selection of the research that has been undertaken to evaluate the use of film for instruction. Too, we will review a selection from the literature of utilization studies where film is used for instruction

We were primarily concerned with locating articles reporting the use of film in library instruction at the college level. Due to a shortage of research papers by academic librarians on the use of film, we have selected papers done by other researchers when it is clear the report is compatible with library instruction.

Kuo (1973) made a study with university students randomly assigned to treatment groups: conventional library lecture, audio instruction, slide/audiotape instruction. television instruction, audiovisual instruction, and control group. The investigation was designed to measure the students capabilities in comprehension and retention of content. Results indicate that the self-paced audiovisual tutorial study followed by a summary question and answer session was the most effective way of increasing student achievement. (16)

Baldwin (1979) with 151 college students in a freshman-level business report-writing course tested the specific hypothesis whether a slide/type presentation produces better immediate recall of basic library information than a conventional library lecture tour. The students were randomly divided into two even groups; both receiving the same information followed by a twenty-item test. The findings were that a slide-tape program does not necessarily produce better immeidate recall of bibliographic instruction than the traditional library tour. These findings contradict F. F. Kuo's

conclusion that a slide-tape program is superior to the lecture tour. This finding indicates the need for further research into the effectiveness of media presentations. (3)

Hall's (1977) study with 149 students enrolled in an Introduction to Pharmacy course used a series (4) of slide-tapes as training tools in the use of the library. The purpose was to make students see the library as an important part of this educational experience. A team effort between media production staff, the course professor, and the librarian produced slide-tapes fifteen to twenty minutes in length covering the card catalog, reference books, current periodicals, and periodical indexes. Effectiveness of the reference unit was determined via a pre-test and a post-test. The difference between the scores was statistically significant, indicating that students did in fact learn the cognitive content of the slide-type on reference books. (13)

McTeer (1977) conducted an experiment using 20 classes in social foundations of education, to see if the use of slides supplementing a lecture-discussion course would raise grades. Each class was comprised of 40 students in graduate study. All 20 classes were taught by the same instructor. Ten classes did not receive the slide presentation while the remaining ten did. A chi-square of 6-16 was computed showing significant difference at the .05 level. Those classes receiving the slide presentation with the lecture-discussion received higher grades at the end of the quarter. Student comments also reinforced the idea that visual presentation added to the instructor's lecture - discussion and aided learning. (21)

Snow (1963) investigated effects of personal characteristics of learners in relation to factual learning from instructional films and from conventional, "live" presentations of the same material. The research approach included selection of fourteen variables, a series of 19 films and 19 corresponding line presentations, each demonstrating an experiment in physics, organized into 14 pairs of demonstrations for inclusion in the introductory physics course at Purdue Univeristy. A total of 437 undergraduates were randomly divided to form two sections. It was concluded that personal characteristics of learners determine, to a significant extent, the amount of learning derived by individual audience members in given situations. (25)

Allen (1965) using two classes composed of junior and senior prospective teachers in the Instructional Materials Department at Southern Illinois University, a study was conducted to determine the effects of the utilization of 2" x 2" color slides in the teaching of a unit of school library reference material. A total of 29 reference materials were studied. One class was divided into two groups: an experimental group which consisted of 16 students and a control group of 19. The experimental group received a lecture accompanied by 180 slides. The control group received the same lecture without slides. The time element was held at two hours and 20 minutes for both groups. An analysis of resulting data showed that the experimental group achieved a considerable gain over the control group.

To further determine the students' reactions to both types of instruction, the second class, consisting of 30 students, received both methods of instruction, and all 30 students indicated that they preferred the slide-lecture because: (1) the slide helped them retain the image of the material; (2) they could see how the contents were arranged; (3) a common denominator of experience was established; (4) questions could be explained visually

instead of just verbally; (5) slides combined with lectures tend to bring out the better qualities of each, and (6) it was easier to take notes from the slide material. (7)

Riley (1973) in an effort to test the value of the silent single-concept loop film (SSCLF) media, an experimental design was developed at the State University of New York, Maritime College, Bronx. SSCLF was used to introduce eight engine lathe skills to freshman engineering students. Seventy-nine Ss were randomly divided into control and experimental groups. The control group received standard lecture-demonstration instruction; the experimental group received identical teacher-performed lecture-demonstration instruction, with the addition of the loop films being shown during and following the lecture-demonstration period and free access allowed to loop films during the repetition-reinforcement learning. Data favored the teacher-plus-film treatment compared with the lecture-demonstration only instruction and was significant at the .05 level. (23)

Liao (1969), using 80 undergraduate students, examined the relative effectiveness of silent and sound 8mm single-concept films as self-instructional programs for teaching the skills of audio-visual machine operation. The students were randomly assigned. The only difference was that the sound version had narration. The performance score was obtained immediately after the training period. There was a significant difference in the performance scores in favor of the sound film. Strong student preference was indicated in favor of the sound single-concept film. (18)

Brady (1976) investigated the effectiveness of 16mm film, printed scripts, slide-audiotape with a discussion component and slide-audiotape without a discussion component plus sought to determine the learner attitudes of the groups of students tested for each of the four treatments. At a .05

level, there was no significant difference in the measures of concept acquisition, affect with respect to the concepts and attitude toward each different mode of instruction. (4)

Gaddy (1971) undertook a microform project to determine whether one could learn as well from reading microforms as from reading conventional printed forms and to what degree the use of microforms was accepted by students. During the 1970-71 academic year, Phase II of this project was undertaken. The research focused on the following factors that were believed to be related to the use of microforms: (1) Access to microfilm equipment and materials. (2) Interaction between the student and the equipment in regard to the mechanics of manupulating the various types of equipment. (3) Types of subject matter content involved. (4) Relationship between positive and negative image microforms. (5) Sequence or format of images on a microform — horizontal or vertical. Four two year colleges in the Washington, D. C. area participated. One or two courses at each of these colleges were selected for the pilot studies. Essentially all readings for these courses were to be done from microform rather than paper copy. Not all students enrolled in these courses participated in the study — the end result was a total of 43 participating students. These students evidenced little resistance to microforms — either microfilm or microfiche and acceptance was not effected by the above five variables. Also, it was found that learning effectiveness using microforms was equal to that of using paper copy. (11)

Coffman (1972) conducted a study to determine if graduate students comprehend microfilmed material significantly quicker than hard copy material of a similar level of difficulty since they tend to read microfilm quicker.

It was concluded that the test population tended to read and comprehend microfilmed material slightly quicker than comparable hard copy material. (7)

Grausnick (1971) studied the advantages and disadvantages of microform for classroom training applications. Three classes in an Air Force training school used microform for a 30-hour course, and three control groups used the same material in hardcopy form. Findings show that the trainees used the microform systems effectively and intensively over the 1-week training period. The experimental group did as well as the control group on examinations. At most, three-fourths of the participants said they preferred to use negative-image fiche for both classroom and home study. (12)

Brewster (1976) undertook a survey at North Texas State University to find out user problems with the microforms collection. Twenty-four interviews were conducted. Data was compiled and it was found that users found it necessary to take more breaks when reading microforms as compared to books. Other objections mentioned were lighting and eye strain; lack of mobility. When given a choice would prefer books to microforms. Advantages of using microforms were also given. (6)

RELATED REPORTS

There are many reports published on orienting users to the library and on instructing them in the use of reference sources. I can find publications on user instruction in all types of libraries and for all types of users from elementary to graduate students. It is evident that the literature on this subject is increasing and a growing number of publications are concerned with the question of evaluating library instruction and its effect on users and libraries.

In this article J. P. Hills defines the purpose of a university education as guiding students towards becoming self-sufficient individuals. Both the academic and the library staff have a definite role to play in this educational process. Some principles of learning as well as the use of audio-visual methods of teaching are discussed in relation to library instruction. Present limitations and future possibilities in this area are also considered. An Appendix provides a list of available slide-tape guides in England, which were prepared by SCONUL (Standing Conference on National and University Libraries). (15)

This is a comment by M. B. Stevenson on P. J. Hills' article published in the above journal in October, 1974. Stevenson criticizes Hills' comments for being too theoretical and feels that a more practical approach is needed particularly in the area of methods for user education. Stevenson also offers some critical thoughts on the use of media in library instruction. He urges that some thought should be given to objective evaluation of any user instruction program. (26)

Kathy Essary, in her article, describes briefly the experienc[illegible]f academic librarians who prepared their first library orientation program

in slide-tape format. (8) In his article, J. L. Lolley, discusses the evolution of an individualized library instruction program at Tarrant County Junior College (Texas) from a slide-tape-workbook program to a text-workbook approach. Also discussed are the use of pre-and post-tests and the results of this individualized library instruction. (19) John Lubans Jr. writes an article based on a 1975 visit to the British Universities Survey, Southampton, Bath, Loughborough, Leeds, Bradford, Lancaster and East Anglia. The author discusses briefly five areas of library use instruction at these universities and compares them to U.S. activities: evaluation, SCONUL slide-tape programs, integration of bibliographic instruction, universal library skills, freshman library skills. (20) Paul Larson in his study purposes individualized media library instruction based on an analysis of the library system. The slide-tape point of use modules exemplified in the study provide consistently needed instruction of high quality to individual users. Included is a 30-frame program for instruction to college library users in the use of periodicals. This report is a follow-up to ED 054765. (17)

A survey by Larry Hardesty is based on responses from 88 academic libraries. It was found that few libraries have produced quality presentations and that the production of such presentations is time-consuming and expensive. For each responding library a summary of their slide-tape presentations is provided. (14)

Nancy Fjalibrant discusses objectives of library instruction, course content and timing of the instruction and various types of teaching methods. The latter include lectures, seminars and tutorials, guided tours, audio-visual instruction, printed guides, exercises, programmed instruction, self-instruction and individualized instruction. (10)

J. G. Brewer tries to present the basic outline of the theory and methodology of evaluation of reader instruction and summarizes major references in this area. Some of the problems with the literature in this area have been that it evaluated orientation programs, highly sophisticated teaching machines and not subject reader instruction. Also the evaluation of comparative studies of instruction is doubtful. Illuminative evaluation which has a humanistic rather than a scientific base could be a possible evaluative method in library instruction. (5)

SUMMARY

The reports cited in this paper were obtained from a variety of sources; Library Literature, Dissertation Abstracts International, Library and Information Science Abstracts, Educational Resources Information Center, and other indexes and cover the period 1964-1979. All of the reports focus upon college level instruction.

Library instruction, although traditionally an integral part of academic library reference service, continues to raise difficult questions for library administrators. In recognizing a demonstrated need among users for a more formalized program of library instruction, administrators are confronted with a number of considerations, including potential instruction recipients, program design and format, assignment of responsibility, location of instruction, and extent of library resource commitment to library instruction for a maximum return in user competency and efficiency.

Ten of the studies evaluate comparative student achievement and three report on student attitudes. One study (Snow) investigated the effect of personal characteristics of learners in relation to learning from film or from traditional methods. This is probably the most sophisticated study encountered in the course of this project.

Most of the studies concluded that the use of film for instruction was an effective tool for instruction. Moreover, the difference between the scores of experimental and control groups were, more often then not, lacking in statistical significance. Thus, the findings of Kuo, Hall and Coffman leading to a conclusion of superiority for their experimental program over the conventional method would only indicate the need for further research into the belief that media is more effective than conventional presentations.

The report by Snow investigating effects of personal characteristics of learners in relation to facutal learning from instructional films and from conventional presentations of the same material is probably the most significant of the studies reported on. He concluded that personal characteristics of learners are more significant than the format of instruction.

CONCLUSION

The research studies support the validity of using film as an instructional tool. Claim for the instructional superiority of films over conventional instruction should be viewed with considerable doubt.

Usually the studies rely upon rather small numbers of people, rather brief contacts with the participants of the study, and a somewhat simplistic need to justify the use of film. It seems to me that their findings certainly do accomplish that end; that films are effective means of instruction.

However, where the investigator is seeking to prove that films are a panacea for learning based upon a rather simplistic study a disservice is done to the media under study. Nevertheless, these studies do show, with a very repetitious sameness, the effectiveness of instructional film.

A review of utilization reports indicates the acceptance by libraries of films to assist in the instruction of how to use a library. It is probably true (14) that few libraries have produced quality presentations and that the production of such presentations is time-consuming and expensive.

The quality of film based library instruction can be expected to improve as instructors come to realize that media are best used when they are used in combination with a variety of other instructional materials and apply an instructional systems approach to the analysis of and development of practical solutions to teaching and learning problems. As we learn more about the characteristics of individual learners and the nature of different cognitive styles, instructional films can be designed to conform to the teaching requirements that result. (29)

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ACADEMIC LIBRARY INSTRUCTION

The Use of Educational Television

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INTRODUCTION

Librarians have little difficulty agreeing that instruction in library usage is acutely needed. Both group and individual methods of instruction are being used. Academic librarians would be very responsive if effective, economical and, above all, testable methods were found to assure them that undergraduate students have mastered basic library use skills and are prepared to advance to more sophisticated use of library collections.

Can instructional television solve the problem of library orientation for large numbers of students? This is one of the questions which many librarians in larger colleges and universities have been asking themselves as they face the task of large freshman classes. For most institutions of considerable size the time has passed when individual class lectures and guided library tours provide adequately for library orientation. Therefore, it becomes fairly obvious that a more efficient means of familiarizing these students with the library must be found than the traditional method of conducting students through the library in groups of twenty to thirty at a time. There are numerous institutions, with first-time degree-credit enrollments of one to three thousand, already overwhelmed by trying to provide even a basic introduction to library services, that content themselves with offering each entering student a library handbook and bidding him Godspeed.

The development of a well-designed library instruction program involves the completion of three major steps in a process of instructional development; that is, define, develop, and evaluate. Each of these steps is integral to the preceding or subsequent steps, and together, these steps form the core of a thorough and complete instruction program. (24)

If we assume that a given library instruction program is well-designed, such a belief leaves unanswered any question challenging the validity of educational television as a teaching tool. This paper reviews a selection of research and utilization studies, both comparative and attitudinal, investigating that very question.

EDUCATIONAL TELEVISION: AN OVERVIEW

The beginning of ETV can be traced to the State University of Iowa whose electrical engineering department developed an experimental station (W9XK) in 1932 and functioned through 1939 transmitting over 400 programs; these were probably the first educational television programs in the United States, if not in the world. (11)

The year 1948 found only five U.S. educational institutions seriously involved with the new media; they were the State Univeristy of Iowa, Iowa State Univeristy, Kansas State College, Univeristy of Michigan, and American University in Washington, D.C. By this time there was little, if any doubt left in the minds of radio manufacturers, broadcasters, and advertisers that television would be the dominant medium of the near future. Education did not share this vision, had not pursued the potentials implicit in the Iowa experiment, and had not determined whether television had a role in education or the nature of the role. (11)

The first nonexperimental educationally owned television station in the world and the 100th television station in the United States began regular programming in February 1950, as WOI-TV at Iowa State University in Ames, Iowa. (11)

The 1948-1952 FCC freeze on new stations was for the purpose of planning nationwide allocations for the future of educational television. As the Commission held preliminary hearings some educators hoped the planning would consider the reservation of channels for educational use since, in any given area, there is a limit as to the number of channels that can be used without interference. The commercial interests were applying considerable pressure in support of a completely commercial channel reservation plan. The Commission,

in the face of little expressed interest or concern from American educational leaders, gave the impression that they were inclined to go in the direction favored by the commercial interests. (11)

However, the educational broadcasting movement, which had found unity within itself at the residential seminars held in the summers of 1949 and 1950 in Allerton House at the Univeristy of Illinois, was able to provide some of the leadership necessary to save educational television. This was a very critical time since the FCC decisions would probably determine the developmental pattern of television for the next two decades. (11)

Indeed, in 1950 when the Commission did release its proposal for the long-awaited plan for a nation-wide television allocation system, there were no provisions for educational needs. The only dissenting opinion from a Commission member was by Freda Hennock who made a precedent setting plea for the reservation of television channels to meet the needs of education for the present and future. She was to provide for the educational establishment of legal and moral platforms on which subsequent action would be based. Attracted by her efforts were such groups as the American Association of Mayors, the National Association of Educational Broadcasters, the Association of Land Grant Colleges and Universities, the Association of State University Presidents, and the National University Extension Association. The high point came in 1952 when the FCC issued its Sixth Report and Order which reserved channels for the educational establishment. (11)

However, the educational institutions were unprepared to actually establish ETV stations. Educators had been pulled and pushed into the FCC battle arena after being bullied into recognizing the need for immediate action in regard to their future in television broadcasting. Nevertheless, a great conceptional gap existed resulting in a lack of understanding of the

role of television in the educational process. Educators had fought for the allocation of reserved channels, but having won found themselves floundering in a situation largely created by their lack of past interest in the newest member of the media. As a result the growth in the number of ETV stations was slow; nineteen years after the issuance of the Sixth Report there were, as of January 1, 1971, 86 VHF ETV stations and 113 UHF ETV stations in operation. (2) There were, at the beginning of 1976, 259 non-commercial television stations in operation. (1)

The emphasis in the 1950's seemed to be on the development of broadcasting stations. Closely akin to closed-circuit television is a limited broadcasting technique. The 2500-mgh system combined with lower tariffs for C.C.TV. made multichannel systems available to schools and institutions of higher education. (3)

Duplicating and playback of prerecorded programs were made far less expensive by the advent of low-cost slant-track, helicol scan videotape recorders. National and state videotape distribution centers, such as the National Center for School and College Television, enabled individual school districts and colleges to develop television programs without going into costly production needs. (3)

The open reel videotape which was predominent in the 1960s and early 1970s is now being rapidly supplemented by the video cassette. The image, in both types, appears on a modified television screen. The newer videocassettes offer color whereas most reel videotapes are black and white. Also, the cassette protects the tape from dust, accidental twisting, and other operational hazards. Operation of equipment is greatly simplified. (20)

Suitable for local production, video has an advantage over film which requires fairly elaborate production facilities. For duplication, erasure, and reuse the equipment has inherent capabilities. The film image is superior for use by large audiences. For individual library viewing or small groups the television screen-size projected image is unexcelled. (20)

Still an experimental medium is the videodisc. The videodisc, if the potentials promised by its producers are realized, will provide increased storage of information in a price range close to that of phonodiscs. (9) In the AV field the best attributes of videodiscs are compactness. Tapes or film require much more storage space at a much higher cost. (23)

RESEARCH REPORTS

In this paper, I'm reviewing a selection of the research that has been undertaken to evaluate the use of television for instruction. Too, I will review a selection from the literature of utilization studies where television is used for instruction.

. was primarily concerned with locating articles reporting the use of television in library instruction at the college level. Due to a shortage of research papers by academic librarians on the use of television, I have selected papers done by other researchers when it is clear the report is compatible with library instruction.

Greenhill and Carpenter (1955) over a period of three years conducted about 100 studies of which approximately 60 were experiments in which comparisons were made under controlled conditions with respect to defined variables. At least 30 different comparisons between televised and direct instruction were made. The same teachers taught comparable groups by the 2 methods at successive class periods with students assigned at random across the two sequences. The result consistently show no significant differences in student achievement between televised and direct instruction. (7)

Reich and Meisner (1972) investigated the relative effectivenss of color vs. black-and-white television concentrated on the factual retention of subject matter, this study was designed to thoroughly analyze subjective attitudes as well. Researchers tested 12 seventh grade classes at experimental Toronto schools. The study found that there was little evidence that color was a different instructional medium than black-and-white. The data suggested that color may reduce the value of the spoken word, making

color a valuable medium when the material to be taught involves visual experience or a dramatic event. (17)

Tien (1974) studied the effectiveness of a teletutorial instruction method compared with a conventional lecture method using 159 students enrolled in an introductory media course at a university. Divided into two groups, they were taught by both methods. Each group received a three week period of teletutorial instruction followed by a three week period of instruction by lecture. Each group received a pre-test and a post-test at the end of each three week instructional treatment. No significant difference was found between groups as a result of the methods of instruction. (21)

Macomber (1957) conducted a study at Miami University of Ohio to determine the relative effectiveness of imparting subject matter to students using three instructional procedures: television, lecture, and discussion. Classes were of different sizes: small, medium, and large. Approximately 4,500 students and 23 separate courses were involved. It was found that with respect to subject matter acquisition there were no significant differences among any of the groups for a particular course taught by the different method. (14)

Holley and Oram (1962) studied whether library skills in a university could be taught as effectively with ETV as with class lectures and guided library tours for a minimum of 500 students per semester. An initial 39 minute tape, "Education Library Tour, " for the Education 101 students proved satisfactory leading to a TV program providing a general introduction to the library system. The first program was evaluated with a post-test and compared with the test results from the actual tours. The tape was demonstrated to be as effective as the tours. Even though the results were the

same, much less staff time was required to communicate the same amount of information. (10)

Because of the broad sweep of the content of the next abstract, I've chosen to place it at the end of this section on RESEARCH REPORTS.

Dubin and Hedley (1969) in a detailed survey of the effectiveness of ITV at the college level report that of 191 comparisons there were 102 which favored ITV and 89 that favored traditional instruction, although most of the differences were insignificant at standard levels of statistical significance. The facts suggest ITV is neither any better nor any worse than the medium of instruction it replaces in achieving results among students. (5)

RELATED REPORTS

There are many reports published on orienting users to the library and on instructing them in the use of the collection. I have found publications on user instruction in all types of libraries and for all types of users from grade school to the univeristy level. In general, it is evident that the literature on this subject is increasing. However, in the reporting of the use of television the literature of the past decade is sparse. Nevertheless, here are some examples of work done with educational television.

Vasilakes (1973) writes that the special library at the Westinghouse Electric Nuclear Center was a closed circuit television system to train personnel. The involvement of the library in this area is growing, and the applications to instruction are discussed. (22)

In his report Yamada (1973) writes on library orientation activities at Hiwassee College in Tennessee. An elective course on the "effective use of the library" was instituted there through the English department, and found quite useful by the students. Television and cassette tapes are also utilized to instruct students in the use of library resources. (26)

The information in Fjaellbrant's (1974) survey on user instruction courses in Scandanavian technological university libraries was obtained by postal questionnaire and interview. Examples of programmes were : (1) Denmark: internal courses for engineering students and library subject specialists and external courses for members of the Danish Society for Technical Literature; (2) Finland: initial compulsory courses for students and optional courses thereafter, using video-programmes, lectures and discussions; (3) Norway: a library orientation course for new students and seminars directed towards special user groups; (4) Sweden: courses emphasizing

computer-based information services given to engineers and students. Cooperation exists both at the local level with engineers in industry and industrial libraries, and at the national level with the use of British tape-slide material in Sweden and, shortly, in the rest of Scandanavia. (6)

Paulson (1968) studied the library orientation programs at eight colleges. Need for student orientation to the effective use of the library has increased. Programs at eight colleges illustrate the variation in such programs -- (1) An orientation tour, C.C.TV., and two briefing sessions, (2) library research assignments integrated with interdisciplinary education courses, (3) film lecture accompanied by a handbook, (4) E.T.V., (5) E.T.V., (6) handbook, (7) teaching machine, (8) Three sessions-greetings, tours, visual projections, lecture-disarmors, three assingments. Though no conclusions can be reached, the extensive sue of E.T.V. is apparent. (16)

This article by Owen (1966), librarian of Candiff College of Education, reports an experiment with closed-circuit television in the presentation of the introductory talk to 350 new students on the use of the library. Despite programme imperfections, it was generally agreed that this attempt to use C.C.T.V. for library instruction was well worthwhile. (15)

This is a brief article based upon a report from the University of Washington (1968) about their new students who are getting their library orientation from a 40-minute videotape which will replace the former library orientation tours for undergraduates. (24)

In this article Jeffries (1976) discusses how an E.T.V. programme was made. He describes the scripting, the rewriting, the casting, and the length of the programme. He believes E.T.V. is the best medium for general undergraduate library instruction because personal instruction, when there are large numbers of potential library users, is impossible. (12)

In this article Heineke (1968) asserts that the greatest single problem facing librarians is a lack of awareness of library materials by library users. To meet this need, a 30-minute E.T.V. tour of the library has been made a part of the University's regular orientation program for freshmen and transfer students. (8)

SUMMARY

The reports cited in this paper were obtained from a variety of sources; Dissertation Abstracts International, Library and Information Science Abstracts, Educational Resources Information Center, and other sources. These reports focus upon public school and college level instructions.

Library instruction, traditionally an integral part of academic library reference service, continues to raise difficult questions for librarians. In recognizing a demonstrated need among users for a more formalized program of library instruction, administrators are confronted with a number of considerations, including potential instruction recipients, program design and format, assignment of responsibility, location of instruction, and extent of library resource commitment to library instruction for a maximum return in user competency and efficiency.

Television as used in education has a far wider range of forms than its commercial counterpart. Even in the array of names used for the noncommercial version there is a good deal of complexity: public television- noncommercial television broadcasting in the general public interest, such as current affairs; educational television - broadcasting of material having educative or cultural value, but not presented as part of an instructionalized curriculum; and instruction television -- part of a formal school program. (25)

All of the research studies evaluate comparative student achievement. Though only one of the studies (Holley and Oram) was library instruction oriented, there should be no reason to question the applicability of the findings of the other studies to library instruction.

The studies by Greenhill and Carpenter (1955), Tien (1974), Macomber (1957), and Dubin/Hedley (1969) found the effectiveness of ITV compared favorably with traditional instruction with differences insignificant at standard levels of statistical significance. The facts suggest ITV to be neither any better nor any worse than the medium of instruction it replaces in achieving results among students.

CONCLUSION

For over two decades instructional television has played a part in the educational scene. During these years more than 1,900 research investigations aimed at finding out how television can improve learning opportunities have been carried out. (25)

There may be identified general cycles of television research and development. They are as follows:

The master teacher concept dominated early efforts since it was hypothesized that if one could locate an outstanding teacher, he might use ITV as the means to work with a larger number of students. Research examination of such early efforts revealed no significant difference by the learners who responded to such instruction. (25)

It had been learned that there is no magic in lessons just because they are televised. Therefore, the new cycle of ITV production that followed was characterized by careful planning by teams of television producers, directors, and assistants to achieve the best possible use of all hands of interelated and needed learning experiences in terms of the goals to be achieved. (25)

Kumata (1960) found that TV shows superiority at the grade school levels. (13) In 1962 Schramm summarized comparisons of ETV with conventional instruction and also reached the conclusion that TV was less effective at the college level than at the lower levels. (18) Cher and Schramm (1967), in another summary, supported the same conclusion. (4)

In the next cycle, research has considered various ways in which the classroom teacher can actively involve the learner in television instruction. It was found that teachers who use the discussion method of instruction achieved the highest and best results from their students. (25) Thus, it

can be generalized, that teachers who conscientiously attempt to involve their students in the lesson and attempt to encourage them to respond actively to questions about the content can achieve statistically significant advantages.

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ACADEMIC LIBRARY INSTRUCTION

The Use of Audiolearning

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INTRODUCTION

Librarians have little difficulty agreeing that instruction in library usage is acutely needed. Both group and individual methods of instruction are being used. Academic librarians would be very responsive if effective, economical and, above all, testable methods were found to assure them that undergraduate students have mastered basic library use skills and are prepared to advance to more sophisticated use of library collections.

For decades a great part of normal classroom instruction has revolved around learner responses to directions, explanations, or descriptions given audibly by the teacher or by fellow students. Nearly 90 percent of the student's time, for some students at the college level, may be spent in listening to discussions and lectures. (27)

In this paper we are concerned with the application of audiolearning to the solving of the problem of library instruction for large numbers of students. Most institutions of considerable size have seen the time pass when individual class lectures and guided library tours can provide adequately for orientation to the library.

The preparation of magnetically recorded explanations, descriptions, directions, or whatever for their use by individuals or groups of learners is referred to as audiolearning. Audiolearning is the use of comprehensive recorded information that refer to related essential materials which the learner turns to and learns from while he simultaneously follows the basic strategy and further explanations outlined to him. In its pure from this reciprocal process is audiolearning.

The development of a well-designed library instruction program involves the completion of three major steps in a process of instructional development; that is, define, develop, and evaluate. Each of these steps form the core of a thorough and complete instruction program. (27)

If we assure that a given library instruction program is well-designed, such a belief leaves unanswered any question challenging the validity of audiolearning as a teaching tool. This paper reviews a selection of research and utilization studies, both comparative and attitudinal, investigating that very question.

AUDIOLEARNING: AN OVERVIEW

There are three general types of sound recordings in common use: phonograph records, magnetic tape recordings, and sound recordings on photographic film. Of these alternatives, the last is limited in educational materials to sound recording for motion pictures. (5)

Disc recordings are more susceptible to damage than tape media and require careful handling. Too, phonograph reproduction is little used in education except to reproduce music because of the technical complexities and costs involved in making recordings for classroom instruction. Although these limitations have contributed to the popularity of tapes, discs seem likely to continue in prominent use, especially for music recordings, which are less frequently available in alternative formats than are spoken recordings. (28)

One of the newer media, magnetic sound recording on an iron oxide coating, has revolutionized audiovisual communications. Not only have audio cassette recorders become common place in all markets of AV media, but magnetic recording is now used in many other applications. (3)

Close to 90 companies manufacture or market the various kinds of audiotape recorders and related equipment. Most tape recorders (reel and cassette) are imported. (3)

Those in the AV industry might be surprised at the small proportion used for professional purposes. Of total annual sales in excess of 16 million recorders, players, copier/duplicators and specialty units, only about 3% go to the AV field. In dollar value, however, the $84 million spent for magnetic recorders in the AV and broadcast markets was more than 8% of the billion dollar market in 1976. (3)

Although magnetic tape recording, as it is known today, is relatively new, the theory of magnetic recording dates from 19th Century Europe. Steel wire recording was first begun with machines which consumed 7 feet of wire per second. Steel tape was introduced as a recording surface prior to 1920. (3)

The invention of the sound amplifier in 1927 spurred a decade of development in the recording field. Steel wire, steel tape and later coated paper tape (first introduced in 1935 at a Berlin exhibition by AEG of Germany) all underwent refinements for applications as office dictation equipment. European broadcasters, however, were among the first users of recording equipment in the early 1930s; a foretelling of things to come. (3)

Tape recordings are easily produced locally, provide sound that does not deteriorite in quality as the recording is used, and allow erasure of the recording by demagnetizing the tape so that it may be used for new recordings as desired. (5)

In addition to its use for group instruction in many subject areas, the tape recording has become the cornerstone of a number of arrangements for individualized study in which the student has access to a wide array of prerecorded lectures, practice and drill materials, and other audiotry recordings from both local and commercial sources. The language laboratory for modern foreign-language instruciton was the first such adaptation, but the language laboratory of 1960 had become a learning laboratory or an electronic laboratory a decade later because of its use in a variety of courses in addition to foreign-language instruction. (5)

One approach was first proposed and implemented in 1961 at Purdue University by Samuel Postlethwait. Postlethwait's audio-tutorial systems approach was an attempt to individualize the teaching-learning situation by providing students with audio-tape discussions in learning carrels equipped with tape recorders. The tapes were supplemented with study guides, biological or other scientific equipment, film loops, and other materials, so that students can take an active part in the learning process. Each audio-tutorial package or module concentrates on a circumscribed portion of factual material. Students are guided in their study by audio-tape and by a series of behavioral objectives until they reach a specified mastery level. (28)

In the years that have elapsed since this audiolearning approach was first developed, it has been adopted by literally hundreds of colleges and secondary schools throughout the country. Beginning in the late 1960's a number of studies were performed which attempted to evaluate the audiolearning approach.

1937 marks the introduction of the first U.S. recorder, The Soundmirror, a steel-based recorder manufactured by Acoustic Consultants. Bell Labs also developed a slow speed recorder (16" per second) in 1937. (3)

Brush Development Co. later bought the manufacturing rights for that first Acoustic Consultants' recorder. Under the R & D leadership of Dr. S. J. Begun, a transplanted scientist who left Hitler's Germany in 1935, Brush Development explored the possibilities of coated paper tape and plated wire recorders in 1939. (3)

World War II brought about new applications for sound recorders. For example, the U.S. forces amplified wire recordings of ships and radar signals to confuse the enemy at Sicily and the Italian Anzio beachhead. (3)

Following the war, Brush unveiled the first U.S. paper tape magnetic recorder at the Institute of Electrical Engineering convention in March 1946, more than a decade after the first German paper tape development. Paper base recorders immediately outsold steel recorders in the U.S. in spite of the coarse and inconsistant magnetic coating, and its susceptibility to humidity changes. Its success, however, was to be shortlived.

In 1947 the 3M Co. first introduced to the public plastic based magnetic tape, a recording material which overcame the problems of other base materials. Immediately the magnetic recording industry blossomed. (3)

Around 1950 the motion picture industry quickly went to tape recording to replace the more cumbersome photographic recording system in the field. Almost overnight the film industry made the switch. (3)

The revolution in mass use came a decade and a half later. In 1964 N.V. Philips, the Dutch electronic giant, introduced the now-famous cassette. Look what happened. In 1966 the AV field bought 98,000 reel-to-reel recorders and about 14,000 cassette recorders, both AC and DC models. Five years later, in 1971, 54,000 reel models were sold while 50,000 AC cassette models went into the AV market along with 172,000 battery/DC cassette models. (3)

It is worth recalling that video recording on magnetic tape was first used on October 30, 1956 when Columbia Broadcasting Co. broadcast the Douglas Edwards News Program on the West Coast on a three-hour delayed basis from the East Coast. (3)

There is an ironic twist to the audio cassette story. Philips has been praised for making the cassette available to the industry without any license. Having one standard cassette allowed a massive market to grow up around the little cassette. Now in recent years a number of other cassettes and cartridges have come into use for specific applications after many years with the one standard. (3)

This experience is the exact opposite of 8mm/super 8 and video recording which each started with a flock of cartridge and cassette configurations and are still struggling to settle on one dominant style. (3)

RESEARCH REPORTS

This is a review of a selection of the research undertaken to evaluate the use of audio for instruction. In another section of this paper, I will review a selection from the literature of utilization studies where audio is used for instruction.

I was primarily concerned with locating articles reporting the use of audio in library instruction at the college level. Since there are very few research reports by librarians on the use of audio, I have selected papers done by other researchers when it is clear the reported use is compatible with library instruction.

Lyon (1972) studied to determine the effects and results of teaching a freshman science course by a modified course involving A-T wherein the students completed all course requirements at or near a study carrel. Each of the students selected two hours per week during which a study carrel was reserved for his use. Two groups of pre- and post-achievement tests were developed for use by the 110 students enrolled in the courses. Six major hypotheses were devised. It was found that the students did learn the content material at significant levels with respect to all the criteria being considered. (20)

Edwards (1969) studied to determine whether the particular office skill of business machines operation could be as effectively learned from filmed demonstration viewed individually in an unstructured, open-laboratory situation as from a traditional classroom method and environment. Two college business machine classes with an unspecified number of students were used. The classes

were randomly divided, with one-half becoming part of the control group and the other, part of the experimental group. A series of 22 sound continuous-loop films and a handout sheet were used. Both groups took an identical final exam. There was a significant difference at the .025 level between the experimental group and the control group in favor of the experimental treatment. (10)

Armstrong (1970) studied to determine if any measurable difference in achievement was gained by an unspecified number of students enrolled in an audio-tutorial botany course during the fall semester of 1969-70. Students took a pre-test during the 2nd week and a post-test during the final examination week. There was a significant gain in achievement as indicated by the pre-test and post-test examination scores. The amount of time spent by the student in the learning center and the final semester grade indicated a strong positive correlation, 0.65. (2)

Russell (1968) studied to determine the effects of two methods of presentation, the traditional lecture and the A-T approach, on the terminal achievement of students. The experimental group contained 233 students and the control group 187 students. Students were drawn from 2 junior colleges. Comparisons were made using six major hypotheses including overall achievement. The study revealed no significant difference in any of the tested hypotheses with the exception of the overall achievement where the control groups surpassed the experimental group, and in the achievement of the female students who surpassed the males. (24)

Jenkins (1972) studied to determine the effect that small group interaction might have on student achievement via A-T minicourses with 108 students selected from a fall semester botany course in 1971. The sample was divided into two groups of 54 students each, the control group and the experimental group. The control group operated in the traditional independent manner in

the learning center, while the experimental group was divided into 9 groups and were presented the minicourses in a group session, round table fashion, with group interaction. Although the test results for the experimental group was higher in every case, statistically the differences were not significant at the .05 level. The results suggest the integration of the independent and small group formats as a program. (18)

Poham (1961) studied to determine the effectiveness of taped lectures vs. live lecture-discussion sessions by teaching an introductory graduate level course by two methods. After dividing the class into two sections and matching them on scholastic aptitude and two achievement pretests, he taught one section in the regular lecture-discussion format and the other by playing a tape-recorded version and holding a brief discussion session. Post tests administered at the end of the course revealed no significant difference between the two groups. (22)

In a later version of the same experiment, Poham (1962) substituted relatively untrained students as discussion leaders in the taped sessions. The results again showed no significant differences between the lecture-taught and tape-taught groups. (23)

Menne (1969) studied to determine the effectiveness of the taped-lecture method as compared to the lecture method. The experimenters provided each student with a tape recorder and a complete set of edited taped lectures in introductory psychology, a course taught every quarter at Iowa State University. Class notes were also provided in booklet form. For two quarters the students taking the course by the tape-lecture method were compared with students taking the course by the live lecture method -- the same lectures from which the tapes used in the tape-lecture method were made. The students participating in the

experiment were matched according to their high school rank in class and measures of achievement and scholastic aptitude.

Post-test scores and final grades showed no significant differences between the two groups. However, further study of the results showed that students who ranked in the lowest quartile of their high school class had a clear advantage over the others. One explanation of this finding is that the poorer student could listen to lectures they did not understand over and over again. Another interesting differences between the two groups was that far fewer students dropped out of the taped lecture classes. (21)

Cornell (1969) studied to determine the success with which the efficiency and the economy of an audio-taped model could be applied to the task of changing the question-asking behavior of experienced, in-service teachers. Fifty-three in-service fourth grade teachers who had seven consecutive years of teaching experience were the subjects. The experimental groups was exposed to an audio-taped model sequence prior to teaching a 10-minute discussion lesson with 3 children. The control group didn't use the tape. A comparison of the two group's evaluation scores didn't support the research hypothesis. (6)

Stuck (1970) studied to determine if concepts of school law could be effectively taught, using simulated materials presented audio-tutorially, to preservice teachers. A senior class of 219 students at Iowa State University was randomly divided into two groups. One group was taught school law concepts utilizing the traditional lecture method of instruction, the other was subjected to the A-T style of instruction. A pre-test and post-test was administered to each group and the growth of each group over time was determined. The experimental (A-T) group showed a significantly greater (.01 level of confidence) increase in achievement than did the traditional group. Three factors and their interactions were considered in the experiment: achievement level of the

student; possible student teaching experience, and group assignment. The only significant factor was group assignment, indicating that teaching technique was responsible for the difference in the learning rate of the two groups. (26)

Gothberg (1976) studied to determine the effects and results of teaching a course in Basic Reference using the audio-tutorial approach. The design of the investigation was a posttest-only-control group design with 63 students randomly assigned to either an audio-tutorial or a lecture group. Data were collected and analyzed using a t-test for two groups and four variables. No significant difference was found between students in the audio-tutorial and the lecture groups in either learning ability or satisfaction with course methodology. (13)

RELATED REPORTS

There are many reports published on orienting users to the library and on instructing them in the use of the collection. I have found publications on user instruction in all types of libraries and for all types of users from grade school to the university level. In general, it is evident that the literature on this subject is increasing. However, in the reporting of the use of audio by librarians the literature reveals far more utilization studies than research studies. Here are some examples of reports done on the subject of the use of audio.

Sim (1975) describes a three-part 50 minute library orientation program for freshmen at Mercer County Community College in New Jersey. It includes a tour, information on the card catalog and on periodical indexes. Printed, audio and visual materials are utilized. (25)

Donthwaite (1976) describes a program at the Nathan Hale High School in Seattle which has a large Learning Resource Center. In order to help students become familiar with it a 15-minute tour on cassette has been developed. The tour is supplemented with printed information. Using this type of orientation has helped to solve the problems of large numbers of students. (9)

Carey (1973) gives a description of a course for students to familiarize themselves with information in the university and college library. The course includes cassette tapes, transparencies, charts and a handbook, and was prepared and is used at Hatfield Polytechnic in Hertfordshire, England. (4)

Hughes (1974) describes a program at the NASA Langley Research Center Technical Library, an audio-tape tour or the library has been developed. It is in cassette form and guides the user through the building. Advantages and guidelines for developing such a tour are given. (17)

Hartley (1976) describes a progam at Appalachian State University. Librarians have developed a program tapes for tours and such reference sources as *Readers' Guide, ERIC, Education Index, Monthly Catalog* and *New York Times Index.* These cassette tapes are available to patrons at any time and in portable format. Comments and opinions collected from patrons about these cassette programs are very positive. (16)

This report discusses the problem of providing 7000 elementary students with instruction in the use of audio-visual equipment. At the Roseville Area Schools in St. Paul, Minnesota, they are trying to solve the problem by using 15 "mini-packets" for various levels. The "mini-packets" contain printed and audio instructions. (1)

Kuo (1973) writes a report on a study to investigate the instructional effectiveness of six methods of library instruction in the Science Division of the Portland State University Library. The methods employed were: lecture, audiotape, slide-tape, television, and a combination of audiotape and discussion session. It was found that the most effective method of increasing student achievement on the ninety-item objective test designed to measure comprehension and retention of the content was the combination of the audio tutorial method followed by discussion sessions led by the librarian. (19)

Dash (1977) writes that the conducted tour may be of doubtful usefulness as a method of reader education, since groups are often too large and vary in degree of library experience. As an alternative, La Trobe University Library decided to introduce self-guided tours for 1st year students, so saving staff time and enabling students to work at their own pace. The text of the tour is in aural form; recorded male and female voices alternate and there are some musical interludes. An evaluation has been carried out via a questionnaire. Some findings were: 1/3 of the respondents had a negative reaction to the

music; 1/3 recorded problems in following instructions. The self-guided tour will be continued, but with modifications: a general audiotape will describe library services and the steps in a search, while relevance to particular subject areas will be achieved through printed handout. (7)

Fjallbrant (1973) writes that interest in the use of tape/slide guides for library instruction is increasing. In Britain, series of 35mm colour slides with taperecorded commentaries have been produced since 1970 by the SCONUL Working Group on Tape/Slide Guides to Library Services. Tape/Slide presentations can be used for group instruction or individual study. The combination of visual and auditory input facilitates learning, and the speed of the information presented can be adjusted to students' needs. The material is reasonably easy and cheap to produce. In 1973, experimental use was made of a number of tape/slide presentations for teaching students at various universities in Sweden. An evaluation test was carried out, and results are tabulated. There was a mean positive learning effects of 29%. An appendix gives an annotated list of the SCONUL guides. (12)

Hall (1977) assesses advantages (familiarity, ease of use, flexibility of timing) of using audio-cassettes as a medium of library instruction. Discusses the practical problems (monotony, incomprehensibility) likely to be encountered in the production of experimental tapes. (14)

Daum (1977) contributes to a special issue of *IATUL Proc.* on the theme, 'User education in university of technology libraries'. User education today plays a central role in German university libraries. The German Research Association is carrying out a project on the use of audio-visual materials in user education programmes. Discusses the programme developed at the University of Brunswick in terms of production and technical installation. Since 1974 more than 75% of users have found this method of instruction useful.

A second edition of the course is to be prepared. There is a shorter and simplified version available for other libraries in the Brunswick area, and many public libraries have shown an interest in this. (8)

Fjallbrant (1976) writes that the main goal of a programme of user instruction in a university library is to integrate the needs of the 3 principal participants: library staff; academic staff; and students. The timing of user instruction is particularly important; it should be given at a point of high motivation in the user. Explains the distinction between orientation and instruction. Covers in detail the different methods of teaching library users: lecture; seminar/tutorial/demonstration; guided tour; audio-visual methods; book/printed guide; practical exercises; programmed instruction; self-instructional material; individual instruction at the reference desk. Whatever methods are chosen it is necessary to carry out careful evaluation. (11)

Hardesty (1977) writes that one of the most popular forms of instructing groups of students in library use is the slide/tape presentation, comprising 35mm slides synchronised with tape narration. However, the lack of commercially-produced presentations requires that librarians use poor quality local productions. Reports a survey conducted by the author in an attempt to indicate the potential and the problems in the use of this technique by academic librarians. The survey shows that slide/tape presentations are widely used by academic libraries but there is obviously much duplication of effort. Good presentations are essential but they take a lot of time, are costly, and require much expertise. Evaluation of teaching effectiveness was not feasible but benefits of use were clear. Suggests that a number of problems could be resolved if institutions cooperated to produce exemplary presentations. (15)

SUMMARY

The reports cited in this paper were obtained from a variety of sources: Dissertation Abstracts International, Educational Resources Information Center, and various periodical articles from Library Literature and other sources. The research reports focus upon college level instruction. The related reports, though predominately utilization reports, do include a few research studies. These reports focus upon both public school and college level instruction.

Library instruction, traditionally an integral part of academic library reference service, continues to raise difficult questions for librarians. In recognizing a demonstrated need among users for a more formalized program of library instruction, administrators are confronted with a number of considerations, including potential instruction recipients, program design and format, assignment of responsibility, location of instruction, and extent of library resource commitment to library instruction for a maximum return in user competency and efficiency.

All of the research studies evaluate comparative student achievement. Though only one of the studies (Gothberg) was library instruction oriented, there should be no reason to question the applicability of the findings of the other studies to library instruction.

The studies by Lyon (1972), Edwards (1969), Armstrong (1970), and Stuck (1970) found the effectiveness of audiolearning compared to traditional instruction with significant differences at standard levels of statistical significance in the favor of audiolearning. However, studies by Russel (1968), Jenkins (1972), Poham (1961 and 1962), Menne (1969), Cornell (1969), and Gothberg (1976) found the effectiveness of audiolearning compared favorably with traditional instruction but with differences insignificant at standard levels of statistical significance.

CONCLUSION

The results of the comparative studies appear to be inconclusive and even contradictory. Of the eleven studies reported here, four found the audiolearning approach to be significantly better and seven found no significant differences.

The facts suggest audiolearning to be neither any better nor any worse than the medium of instruction it replaces in achieving results among students.

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ACADEMIC LIBRARY INSTRUCTION

The Use of Programmed Learning

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INTRODUCTION

Education for other than a select few is, when viewed from a historical perspective, a recent phenomenon. The concept of education for the masses is given a wide range of interpretations throughout the world. For instance, in some countries it means basic literacy training for the people while in other countries it means a college education for the common people.[6]

Advanced education or postsecondary education for the masses is a national goal and, as a result, a large-scale enterprise in the United States. Such an educational system, with its reduced selectivity, supports a strongly heterogenous student body. Traditional methods of instruction, geared as they are to homogenous groupings of learners become less useful when learning needs must span the full range of human ability. Probably, as a result of this, the move toward individualized instruction in the United States is stronger than anywhere else in the world.[6]

Learning programs, when called individualized instruction, are usually structured and incorporate behavioristic principles of learning. These include clearly defined objectives, small units of learning, and a test of knowledge or skills that provide immediate feedback and reinforcement for the learner. Most individualized instruction will also provide for individual differences in the rate of learning. Students may proceed through the self-paced learning units as rapidly or slowly as necessary. The concept of mastery learning, in which a student must learn to master one unit before proceeding to the next one, is now incorporated into many of the individualized instruction systems.[6]

In use today in institutions of higher learning are three major systems of individualized instruction. These three systems are programmed instruction, the Audio-Tutorial (A-T) method, and the Keller Plan or Personalized System of Instruction (PSI).

In this paper we are concerned with the application of one of these major systems of individualized instruction, programmed instruction, to solving the problem of library instruction for large numbers of students.

PROGRAMMED LEARNING: AN OVERVIEW

Programmed instruction, in its modern form, has many antecedents in educational methods used in the past, in particular, ideas developed by Sidney Pressey (1920's) which anticipate more recent developments. A number of advances in instructional methods during World War II. such as simulators used in military training, are also important in this regard. It was not until the 1950s that the possibilities of using teaching machines and programmed learning methods on a large scale began to be considered seriously. The increasing attention was largely the result of the publicizing efforts of B. F. Skinner (1950s). He not only drew attention to the limitations of current teaching methods, but also himself developed methods for antomating instruction and was effective in producing and in encouraging others to produce appropriate learning materials in programmed form.[13]

Programmed instruction is defined by James Popham as a process of designing instructional materials and systems which results, if followed to its full extent, in a rationally constructed and empirically validated product, or set of procedures.[16] Donald P. Ely defines a program as a sequence of carefully constructed items leading the student to mastery of a subject with minimal error. The distinguishing characteristic of programmed materials is the testing procedure to which they are subjected. Empirical evidence of the effectiveness of each teaching sequence is obtainable from the performance records of students.[3]

Programmed instruction is, as the definition suggests, characterized by a special development process more than by any particular format or transmission mode. Most frequently programmed instructional materials appear in a print format but may be films, slides, television materials, or some combination of all of these. All presentation forms of programmed materials

may be classified in three groups:

(1) Print-mediated

(2) Machine-mediated

(3) Computer-mediated[3]

The use of a format other than a print-mediated one can be determined by the following needs assessments.

1. Do there exist speical stimulus-response requirements? For instance, the attainment of the objectives of the program may require types of sensory inputs or types of student responses not possible with a print-mediated program. An example of this would be the need for oral-aural drill in foreign language learning.
2. Do there exist any control requirements? For instance, the instructional objectives or student characteristics may demand pacing, sequencing, cheat-proofing, or other controls beyond the capabilities of a book or pamphlet.
3. Does there exist a less expensive format than the book or pamphlet? For example, provided there is no loss in learning, it may be less expensive to use a non-print format. A reusable, non-print program may permit amortization of costs over enough pupils to reduce the cost for each user below that of a print-mediated program.[3]

The term teaching machine was, in the late 1950s and early 1960s, at least as familiar as the term programmed instruction, if no more so.[3] However, with the passage of time, it became apparent that the organization and presentation of material seems to be more important than not only the precise method of programming, but also of the type of machine or device used. Except in the case of computer-assisted instruction, the importance of machines and devices in programmed instruction was found to have been exaggerated.

It would not be totally inaccurate to say that the role of the teaching machine is little more than that of a glorified page-turner. The machine in no way determines the course of learning nor provides any but mechanical aides to presentation. A machine may add to the convenience of instruction by providing quick access to the various units of material. However, it generally makes little difference to learning whether a teaching machine, a simpler device, or a programmed book is used.[13]

Compared with presentation in program book form the convenience that teaching machines and devices may provide, may not compensate for the disadvantages which are cost, lack of portability, and the tendency to break down. In contrast with the earlier predictions of the late 1950s and early 1960s, this probably accounts for the rather small number of teaching machines now found in the colleges and universities.[13]

Schramm (1962) and Gage/Unruh (1967) described programmed instruction as a revolution while, on the other hand Pressey (1964) thought it was a bubble that had burst.[16] The original excitement about the apparent promise of programmed instruction in education, it now seems, along with the corresponding threats it posed, were based upon estimates of the magnitude and variety of changes in education that it would make possible somewhat naive. It is now evident that what was then an essentially new medium of instruction with certain useful but well-defined and limited advantages over existing methods, was incorrectly seen as a fundamental educational innovation.[13]

Programmed learning, when used in appropriate situations and with imaginative organization and presentation of material, does have some very clear advantages over other methods of instruction. The gradual step-by-step presentation, the opportunities for active learner responses, the provision of feedback, can and have been effectively used in instruction, and in some ways these can provide learning situations which approximate those in which there is one teacher for each learner. The feedback and active response provisions, can provide some of the features that would otherwise be possible only when a teacher has the opportunity to react to each learner's individual responses. Plenty of programmed learning materials exit and are successfully used at many levels of education.[13]

In some important, but clearly restricted ways programmed instruction is a teaching medium which can be adaptive to the needs of individual students. With the use of computer-assisted instruction some of the restrictions can be overcome. It is possible, for instance, to present materials in various different modes. Using films, slides, and television, separately or together auditory and visual presentation are possible. With the aide of a computer it is possible to make far more complete reactions to the learners' responses. For instance, the learner can respond in various different ways such as by speech, by typewriter, or by light pen. When a computer is used it is possible to use other information in order to determine the sequence of instructional items. Whereas, with conventional programmed instruction the frame to which the learner is directed is determined solely on the basis of his performance on the previous frame.[13]

Although it is true that computer-assisted instruction has exciting potentialities, it has a long way to go before they are realized due to difficulties related to cost and to various practical problems. Up to the present, though large sums of money have been made available, most users of CAI have not differed very much from what can be done without expensive computer facilities. Though it is a fact that systems in use at present provide the instructor very little assistance, this will change in the future.[13]

But, how do we find programmed books? They don't appear in bookstores and, only infrequently in libraries. Books In Print, the major listing of books, lists some. However, the only complete list is Programmed Learning by Dr. Carl H. Hendershut which should be available in most academic libraries.[11]

RESEARCH REPORTS

This is a review of a selection of the research undertaken to evaluate the use of programmed learning for instruction. In another section of this paper, I will review a selection from the literature of utilization studies where programmed instruction is used.

I was primarily concerned with locating articles reporting the use of P.I. in library instruction at the college level. Since there are very few research reports by librarians on the use of P.I., I have selected papers done by other researchers when it is clear the reported use is compatible with library instruction.

Hagerman (1979) studied to determine the value of computer supplemented instruction following mediated instructions for library orientation of college freshmen. The population consisted of an unspecified number of freshmen in a Fundamentals of Speech class taught the winter term of 1975. The four groups in the study were the (1) control group, (2) the CSI group, (3) the instructor led discussion group, (4) and a group receiving the complete (non-individualized) computer printout. Data analysis concluded the CSI is an effective teaching medium and makes effective use of student and instructor time.[9]

Hansen (1975) studied to determine if there was any measurable difference in achievement between three methods of presentation: 1) Lecture, 2) Slide/tape overview, audiocassette modules plus workbooks, and 3) Slide/tape overview, programmed text self-instruction modules plus workbooks. The subjects were 154 community college students in English 112 divided into two control groups and three experimental groups. Posttest scores of methods 2 and 3 were 33 percent higher than method one. The difference between methods 2 and

3 was statistically insignificant. A forced choice attitude survey indicated students and faculty did not prefer one method of instruction over another.[10]

Kirkpatrick (1978) studied to determine the relative effectiveness of two types of instructional media in a self-paced remedial algebra course. Sixty students were divided up into three classes of 20 each; a Programmed Instruction group, a Multimedia Instruction gorup, and the Control group. The major results of the study were that using the Duncan Multiple Range at the .05 level of significance, the MM group mean was significantly higher on the postachievement test than either the control or the P.I. group and the P.I. group mean was not significantly different from the control gorup with respect to the postachievement test.[14]

Wood (1979) studied to determine the effects of a C.A.L. program about the card catalog on both external use and attitude toward the library. Sixty undergraduate student subjects, chosen at random and stratified by the control variables and five undergraduate schools, in both the experimental and control groups. Circualtion was measured for a 6-week period prior to and after the pretest. Analysis of the data revealed that the C.A.L. program significantly and postively increased both borrowing and attitude toward the circulation from the library.[25]

Medley (1975) studied to determine the relative effectiveness of two types of instructional media in a self-paced remedial algebra course. Thirty students were enrolled in the one semester course. The students were randomly assigned to one of two groups. Group M, with 15 students, received instruction through a mixed-media package published by Harper and Row. Group P, with 16 students, received instruction through a programmed textbook series published by Prentice-Hall. When results were analyzied at the 0.05 level of significance it was found there was no significant difference in the

level of achievement between the two methods. However the mixed-media method sustained self-motivaiton longer than did the programmed textbooks.[18]

McCreary (1975) studied to determine the effectiveness of a guided discovery method and a programmed instruction method as compared to the effectiveness of the lecture-text method. The sample for the study consisted of 81 freshmen students enrolled in 3 sections of an Algebra course. A typical student had scored low on the mathematics placement test. The students were assigned through a random process to one of the three different classes. It was concluded that the three methods of teaching are equally effective for the type of student used in this study when the criteria is student achievement as measured by the grade. P.I. may be more effective if the objective is to develop computational skills. The P.I. method may be more effective if the objective is to develop skills of a higher cognitive level.[17]

Smith (1975) studied to determine whether achievement in mathematics is affected by three different teaching methods: lecture, guided discovery, and programmed. Sixty randomly chosen students were assigned to three separate classes: twenty to the discovery method, twenty-three to the lecture method, and seventeen to the programmed technique. It was concluded that superiority over the lecture method cannot be claimed by either the guided discovery or programmed method but because the interest generated in class and out of class by the discovery method students was so high and more progress was demonstrated in problem solving, there is a very strong argument in favor of guided discovery.[21]

Toler (1975) studied to determine the comparative effectivenss of programmed instruction, cued-videotape modeling, and behavioral feedback on the acquisition of interview skills. From 301 female undergraduate majors who achieved scores on the HFT in either the upper or lower 15% were selcted as

possible subjects. Subjects were randomly assigned to one of five experimental conditions: (1) programmed instruction, (2) P.I. and written behavorial feedback, (3) cued-videotape modeling, (4) cued-videotape modeling and written behavioral feedback, and (5) no-treatment control. The assessment found P.I. with feedback to be relatively more effective than the other four instructional methods in teaching confrontations and to a lessor extent probes.[24]

Williams (1972) studied to determine achievement and attitude change if students were taught by 3 different instructional methods: (1) Control group by lecture method, (2) Programmed text, (3) Programmed material placed on slides. The study dealt with 2 units of instruction included in almost every business math curriculum. Neither the age level or number of students were mentioned. A statistical analysis of the results of the pre and post tests indicated learning by the experimental groups was greater than that of the control groups. Group 3 scored higher on the post math test than group 2.[26]

Siberman (1962) found, after a review of 15 field experiments, that Programmed Instruction took less time to complete than traditional instruction. In nine of the 15 studies students in the programmed instruction group scored higher than their counterparts in classes taught traditionally. The other six studies revealed no significant difference between the two instructional techniques.[19]

Lange (1972) after reviewing 112 comparative studies aimed at matching Programmed Instruction and traditional instruction between 1960 and 1964 reported that 41 per cent of the studies surveyed showed programmed instruction to be superior to traditional instruction, 49 per cent showed no difference and 10 per cent found P.I. to be less effective than traditional instruction.[15]

Edwards and Judd (1972) in an experiment comparing the relative effectiveness of CAI in replacing small group discussion sessions of large lecture classes in a course in special education assigned undergraduate students at the Univeristy of Texas to one of three groups: (1) use of a handbook and participation in discussion; (2) joined only discussion sessions; and (3) use of handbook and CAI, but no discussion sessions. Although the results were mixed, the evidence favored the test performance of the CAI group rather than the discussion groups. CAI can be successful in replacing small group discussion sessions in a college course of this nature.[8]

Computer assisted instruction (CAI) is one of the newer instructional media to be used in the classroom. It is also the most expensive, especially in terms of the initial cost of instruction per hour. Until recently most CAI projects were developed in univeristy research settings, but more school districts and universities are adopting programs for daily use.

Adams (1969) in an experiment conducted over a two-year period at the State University of New York, Stony Brook, compared the effectiveness of CAI to regular classroom instruction in teaching a course in introductory German. Both groups received three hours of instruction per week in regular classes. In addition, the control group had one hour a week of language laboratory, and the CAI group received instead one hour a week of computer instruction in reading and writing. When the two well-matched groups (based on the Modern Language Aptitude Test) were tested it was found that:

1) CAI students performed substantially better on tests of reading and writing than the control students.
2) CAI students had a favorable attitude toward computer instruction.
3) Control students showed a very slight (if any) advantage in listening and speaking.[1]

RELATED REPORTS

There are many reports published on orienting users to the library and on instructing them in the use of the collection. There are publications on user instruction in all types of libraries and for all types of users from grade school to the university level. In general, it is evident that the literature on this subject is increasing. However, in the reporting of the use of programmed instruction by librarians the literature reveals far more utilization studies than research studies. Here are some examples of reports done on the subject of the use of programmed instruction.

Closurdo (1974 reports that student nurses were informally taught the use of the library at St. Joseph Mercy Hospital in Pontiac, Michigan. Though the program proved valuable it was found to be inadequate because of turnovers, staff limitations, and so on. *A Programmed Guide to the Use of Index Medicus* was produced by the library. It includes an introduction to the library. The guide is available at the point of use of *Index Medicus*.[4]

Slavens (1969) reports that computer-assisted instruction can made a start towards remedying; (1) the acute shortage of faculty members; (2) inadequate teaching methods; (3) problems of providing instruction at different levels; (4) the lack of self-instructional materials. The computer is not needed in the development but may be useful in the administration of diagnostic tests. It can be used to develop programmed learning exercises and for simulating library situations.[20]

Bienteier (1973) reports that an awareness of the disadvantages of a particular method of teaching is useful, some general questions are raised concerning the self-paced or personal system of instruction (PSI) for lbirary science as implemented along lines suggested by Keller. Modified approaches are presented as alternatives.[2]

Starks (1972) reports on a study conducted to assess the effectiveness of methods of computer-aided instruction included the devising of pre-test, evaluative techniques and assessment of attitudes. The programs were written in FOIL. The course was divided into 10 units in the form of drill and practice exercises. Simulated interactions between a librarian and a patron were prepared for 3 units. It was not clear that CAI helped students to learn more, but the computer enabled the developers readily to revise, edit and expand the materials throughout the project. Student attitudes tended to be negative, but it is hoped that subsequent revisions of the program will alter this. Further research and a 2nd study are underway on the effectiveness of the reference materials in teaching course content within an independent study context, which includes an investigation of the personality factors involved in independent study choices.

Hicks (1976) reports that Illinois University has developed a computer-assisted instruction (CAI) system, called PLATO (Programmed Logic for Automatic Teaching Operation). At the College of Veterinary Medicine in Urbana there are 30 PLATO computer consoles, giving access to various CAI programs, including one on the library and its resources. Details of this program are given. It provides information on the layout of the library, a recent acquisitions list and a current faculty publications list. The basic program took 50 hours to write and is updated each week; it is evaluated regularly.[12]

Cooper (1976) reports that user instruction in the utilization of computer-based and traditional services is very apparent at the Ohio State Univeristy Libraries which provides a computerized literature service through the Mechanized Information Center. All student requests are channelled through a librarian and during the reference interview the librarian, in addition to assessing the patron's needs, provides personalized library instruction about

MIC search procedures. Instruction covers retrospective services; current awareness searches; discussion of search results; abstracting/indexing services; information about guides to the library; and use of the card catalogue.

Todd (1977) reports on the use of microfiche as (1) an alternative to the printed sheet for resource materials, including periodicals, student notes and past examination papers; (2) a medium for self-instructional programmed learning provided through the SIMPLE system of self-paced instruction. Describes the principles of SIMPLE and an experiment in using it in which 90 mathematics students participated. The experiment suggests that self-paced learning using microfiche is a viable complement to conventional teaching and that resource centres can play their part in this respect.[23]

Yaple (1976) has prepared a bibliography identifying programmed instruction materials for library education from 1960-1974. All types of P.I. that form some kind of self-paced instruction sequence concerned with library education are included.[27]

SUMMARY

The reports cited in this paper were obtained from a variety of sources such as Dissertation Abstracts International, periodical articles via Library Literature Index and other sources. The research reports focus upon college and university level instruction. The related reports are predominately utilization reports. All of the reports focus upon instruction in higher education.

Library instruction, traditionally an integral part of academic library reference service, continues to raise difficult questions for librarians. In recognizing a demonstrated need among users for a more formalized program of library instruction, administrators are confronted with a number of considerations, including potential instruction recipients, program design, and format, assignment of responsibility, location of instruction, and extent of library resource commitment to library instruction for a maximum return in user competency and efficiency.

All of the eleven research studies evaluate comparative student achievement. Though only three of the studies (Wood 1979, Hansen 1975, Hagerman 1979) were library instruction oriented, there should be no reason to question the applicability of the findings of the other studies to library instruction. Data analysis found the results of the Hansen (1975) study to be significantly in favor of P.I., while the Hagerman (1979) study supported it as an effective means of instruction, while the Wood (1979) study using C.A.L. also found positive results.

The studies by Hansen (1975) and Kirkpatrick (1978) found the effectiveness of programmed learning compared with control groups to have significant differences at standard levels of statistical significance in the favor of

P.I. However, studies by Medley (1975), McCreary (1975), Smith (1975), Toler (1975), and Williams (1972) found the effectiveness of P.I. compared favorably with the control gorups but with differences insignificant at standard levels of statistical significance. It is probably accurate to include the C.A.L. studies by Edwards and Judd (1972) and Morrison and Adams (1969) in the later category.

CONCLUSION

The results of the comparative studies appear to be inconclusive and even contradictory. Of the eleven studies reported here, three found the P.I. approach to be significantly better while seven found no significant differences.

The inconclusive nature of these findings are substantiated by Silberman (1962) who found nine out of fifteen studies to favor P.I. as possessing significant differences. Lange (1972) after reviewing 112 comparative studies reported that 41% of the studies survey showed P.I. to be superior to traditional instruction, 49% showed no difference, and 10% found P.I. to be less effective than traditional instruction.

However, Dubin and Tabeggia (1968) pooled the raw data from ninety-one studies conducted between 1924 and 1965 on the relationship between achievement and instructional arrangements. Generalizations were reached based on the pooled data and not on the conclusions reached by the individual experimenters. The instructional conditions studied included: lecture, discussion, several arrangements of lecture-discussion meetings, supervised and unsupervised independent study, television, and programmed materials. Based on analysis of the data, the authors conclude:

> These data demonstrate clearly and unequivocally that there is no measurable difference among truly distinctive methods of college instruction when evaluated by student performance on final examinations.

The facts would seem to suggest programmed learning to be neither any better nor any worse than the medium of instruction it replaces in achieving results among students.

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ACADEMIC LIBRARY INSTRUCTION

The Use of Visual Learning Material

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INTRODUCTION

Librarians have little difficulty agreeing that instruction in library use is acutely needed. Both group , individual, traditional, and non-traditional methods of instruction are being used. Academic librarians are very responsive when effective, economical and, above all, testable methods are found to assure them that their students have mastered basic library use skills and are prepared to advance to more sophisticated use of library collections.

For decades a great part of instruction has been provided through classroom conditions with learning revolving around student responses to directions, explanations, or descriptions given audibly by the teacher or by fellow students. As the number of students have grown, so to have the variety of supplemental instructional techniques.

Most institutions of considerable size have seen the time pass when individual class lectures and guided library tours can provide for orientation to the library. Therefore, librarians have turned to the use of films, television, audio-tutorial, and programmed learning.

In this paper we are concerned with the application of visual materials to the solving of the problem of library instruction for large numbers of students. Visual materials, as a term of reference, may encompass a wide range of media. This group may be divided into two categories; those materials large enough not to require projection and those materials requiring projection for a group audience.

Visual materials combine rather naturally and effectively in a lesson and have distinctive functions. They have a summary nature and typically do require some background of information if they are to be used effectively.

Care in selection is possibly the first essential for effective learning results with visual materials. The best basis yet discovered for assuring effective learning results is the application of instructional development principles.[26]

VISUAL MATERIALS: AN OVERVIEW

Visual materials are a major category of media including a rather wide range of items that can be roughly grouped on a continuum beginning with those items that are large enough to be used without a mechanical projector and ending with those that do require projection for group use.

These materials are also characterized by being still, and range from simple, readily available materials requiring little or no technical preparation to fairly complex materials requiring use of specialized equipment.[3]

The primary emphasis of this paper are the visual material which comprise the first group. This group includes charts, maps, study prints, art prints, photographs, and realia (i.e. real things and their three-dimensional representations). A map or print may contain, in content, the same image as a slide or filmstrip frame with the physical dimensions and use requirements being the chief distinctions. An advantage for the user of these materials is that of direct contact. However, their size and contents do pose some unique problems for the instructor insofar as keeping them in a collection is concerned.[26]

Although maps have usually been associated with the study of geography, their ability to portray spatial relationships can add to the understanding of such subjects as history, astronomy, environmental sciences, and economics. They can convey information on natural resources, transportation patterns, population trends, and other topics.[3]

Whereas maps are pictorial, charts more often are graphic in their representation, and therefore have special relevance for statistical data.[1]

Prints are typically reproductions rather than original impressions and may be classified by content into art prints and the more general study

prints covering historical events, pictures of animals, scenes of urban or industrial living, and the like.[10]

Photographs have a wide subject application. Too, the same negative that produces the photograph may, under different production methods, produce the frame of a slide, filmstrip, or motion picture. However, the need for careful handling of the negative makes the slide or its equivalent more versatile and durable for instructional purposes.[10]

Realia, sometimes called artifacts or specimens, are original objects such as flags, tools, machinery, clothing, and the like. Modified objects are specimens such as dissections, microscopic slides, and exploded objects.[26]

Models are reproductions of objects not readily obtainable as originals, such as plants, anatomical parts of animals or humans, or atomic structures. They also include static, cutaway, and working models. Diorams are three-dimensional scenes using dolls, figurines, and other three-dimensional representations with painted pictorial backgrounds. Mock-ups are representations of real things simplified in order to highligh specific functions or essential parts.[3]

Realia, models, and the like convey a high degree of reality secondary to actual field study. They are relatively expensive and require special storage requirements which generally limit the number available for instruction.[3]

Educational games and their more complex simulation counterparts stand slightly apart from other media in that they require involvement rather than observation. They permit acquisition and refinement of ocmplex behavior patterns without excessive costs, risks, or other complications that might result from direct, first-hand learning of the same behavior.[3]

The most simple still visual materials are those which do not need to be projected. The main resources for bulletin board displays are drawings,

sketches, posters, maps, charts, graphs, diagrams, cartoons, and photographs. Thus, these materials may be used for both group and individual study.[26]

When it is advisable to present any opaque material with a flat surface of group observation and study, it is possible to project it in an opaque projector.[1]

Other visual resources that must be projected include slides, filmstrips, and transparencies. Stereoscopic slides and stereo reels provide images that give the impression of being three dimensional. Microscopic slides, most frequently used individually, can be shown to an entire class by using a microprojector. And, tachistoscopic techniques provide timed, controlled presentations of projected images which are useful for remedial readings, visual acuity training, and related purposes.[26]

RESEARCH REPORTS

This is a review of a selction of the research undertaken to evaluate the use of visual material for instruction. In another section of this paper, there is a review of a selection from the literature of utilization studies where visual materials are used for instructional purposes.

The objective of this section was the location of research reports evaluating the use of visual material in library instruction at the college level. There were no research reports by librarians on the use of visual materials that could be located. Therefore, reports done by other researchers have been used when it was clear the reported use was compatible with library instruction.

Dwyer (1970) investigated the effectiveness of four types of visual illustrations used to complement oral instruction and to compare their relative effectiveness when projected on viewing areas of different sizes. Each of the 588 students received a pretest, participated in his respective presentation, and received four individual criterial measures. Results indicated that (a) the use of illustrations to complement oral instruction does not automatically improve achievement, and (b) merely increasing the size of visual images used to complement oral instruction will not necessarily improve achievement.[5]

Dwyer (1970) studied to measure the effectiveness with which different types of visual displays facilitated student achievement of different learning objectives when these were used to complement oral instruction. Questions preceded each display and were designed to direct student attention to relevant learning cues. Each student received a pretest, participated in his respective visualized presentation, and received 5 individual criterial measures. Analyses indicated that (a) the use of questions to complement the

more realistic visuals is not an effective technique for improving student achievement and (b) all types of visual displays are not equally effective in facilitating student achievement of different learning objectives.[6]

Dwyer (1971) designed an experiment to evaluate the validity of students perceptions of the instructional effectiveness of four different types of black and white and colored illustrations. Two hundred and sixty-one university students were randomly assigned to one of the nine treatment groups: one group was the control. Each student received a pretest, participated in his respective instructional presentation, received four individual criterial tests, and completed a Visual Illustrated Qeustionnaire Results indicate the use of illustrations to complement oral instruction is an effective way to improve achievement. However, the differences did not reach the .05 level of significance.[7]

Leps (1979) studied to investigate the effectiveness of a visual instructional strategy suitable for learners characterized as holistic or non-linear in learning preference. The study used over 200 university students (of whom 190 completed all parts) randomly assigned by classes to two treatments. One instructional strategy used non-linear instruction based on multi-imagery as a tape/slide presentation. The non-linear instruction strategy was contrasted to a linear, sequential, visual strategy, also presented in the tape/slide format. No statistically significant aptitude/treatment interactions were observed.[16]

Meena (1979) studied to determine the effect of the presence of advance organizers and their subsequent effect upon learning and retaining information presented from an instructional film. The participants were 84 undergraduate students who received one of 3 treatments: (1) written advance organizer; (2) graphic advance organizer; or (3) non-organizer control passage. Results

indicated that both written and graphic advance organizer treatments were significantly superior to the non-organizer treatment. Also, retention was significantly better. There was no difference between the written and graphic organizer groups for learning and retention.[19]

Dwyer (1971) designed an experiment to evaluate (a) the effectiveness of eight types of visual illustrations used to complement programmed instruction when students, prior to receiving their instructional units, received specific instructions as to the types of information they were expected to obtain from their instruction; and (b) the validity of student perceptions regarding the instructional value of varied types of visual illustrations used to complement programmed instruction. 259 students at the Pennsylvania State University were randomly assigned to one of the nine treatment groups. Each student received a pre-test, participated in his respective programmed presentation and received four individual criterial measures. The results of this study indicate that (a) all types of visual are not equally effective in facilitating student achievement of different learning objectives; (b) the use of specific instructions to focus students' attention on relevant learning cues in the more realistic illustrations is not an effective instructional technique; and (c) the types of visual that students themselves perceive as being most effective are not the ones found to be most effective in facilitating their achievement.[4]

RELATED REPORTS

There are many reports published on orienting users to the library and on instructing them in the use of the collection. Publications can be found on user instruction in all types of libraries and for all types of users from grade school to the university level. In general, it is evident that the literature on this subject is increasing. However, in the reporting of the use of visual materials by librarians the literature reveals far more utilization studies than research studies. Too, it is rather rare that visual materials, other than the projected skills, are written up in the literature. That fact becomes evident in the following examples of reports or papers or articles done on the subject of the use of visual materials.

Stevens (1973) discusses the use of Pathfinders, originated at MIT, to introduce library users to the variety of information sources on particular topics available in research libraries. Pathfinders are like maps to the resources in a library, and it is their function to get the library patrons started on their information search.[23]

Browning (1975) writes about 'Calender Clue' which is a detective-type game developed to promote a new approach for librarians responsible for teaching library reference skills to young pupils. The game is played on a weekly basis. Pupils are given daily clues or pieces of information by the librarian which, when added together over a 5-day period, form a profile of a person, place or thing. An example is given and the process explained. To evaluate the project, the game was extended to 6 elementary media centres for a 9-week period. Apart from its success in promoting reference skills the games, played in competition, created much interest and excitement.[2]

Fjalibrant (1976) discusses objectives of library instruction, course content and timing of the instruction and various types of teaching methods. The latter include lectures, seminars and tutorials, guided tours, audiovisual instruction, printed guides, exercises, programmed instruction, self-instruction and individualized instruction.[12]

Harris (1978) writes that as independent study becomes increasingly common in higher education, so project work becomes increasingly useful as a study method. 6 aims of projects are suggested and discussed: (1) involvement; (2) skills for independent work; (3) skills for group work; (4) skills for effective communication; (5) knowledge; (6) personal development. These may be related to projects primarily based on literature search and observation or on experimental research. A major problem in effecting this form of study is that lectures do not possess the very skills in use of reference tools, abstracts and indexes which the student needs to pursue independent study. The Travelling Workshops Experiment, located at Newcastle upon Tyne Polytechnic and funded by the British Library has been developing teaching or learning packages, and containing student handbooks, practical exercises, tape-slides, posters and evaluation packs.[13]

Kathy Essary (1975) describes briefly the experience of academic librarians who prepared their first library orientation program in slide-tape format.[11] John Lolley (1975) discusses the evolution of an individualized library instruction program at Tarrant County Junior College (Texas) from a slide-tape-workbook program to a text-workbook approach. Also discussed are the use of pre-and post-tests and the results of this individualized library instruction.[17] John Lubans Jr. writes an article based on a 1975 visit to the British Universities of Survey, Southampton, Bath, Loughborough, Leeds, Bradford, Lancaster and East Anglia. The author discusses briefly five areas

of library use instruction at these universities and compares them to U.S. activities: evaluation, SCONUL slide-tape programs, integration of bibliographic instruction, universal library skills, freshman library skills.[18] Paul Larson (1972) proposes individualized media library instruction based on an analysis of the library system. The slide-tape point of use modules exemplified in the study provide consistently needed instruction of high quality to individual users. Included is a 30-frame program for instruction to college library users in the use of periodicals.[15]

Hills (1974) defines the purpose of a university education as guiding students toward becomeing self-sufficient individuals. Both the academic and the library staff have a definite role to play in this educational process. Some principles of learning as well as the use of audio-visual methods of teaching are discussed in relation to library instruction. Present limitations and future possibilities in this area are also considered. An Appendix provides a list of available slide-tape guides in England.[14]

M. B. Stevenson (1975) criticizes Hill's comments for being too theoretical and feels that a more practical approach is needed particularly in the area of methods for user education. Stevenson also offers some critical thoughts on the use of media in library instruction. He urges that some thought should be given to objective evaluation of any user instruction program.[24]

This is an article (1973) reporting on a team teaching effort in the Acacia School system in Hemet, California. Team teaching for 6th and 7th graders is being urged by the principal. This involves also the librarian as resource teacher. A unit on library skills is part of the writing of a research paper. Pre-tests, transparencies and post-tests are used by the librarian to teach the needed library skills.[25]

Elza (1975) writes a description of a project to encourage tenth grade students in language arts or science to learn about reference materials by utilizing their interest in ecology. The project is in the form of a game and rules and descriptions are included.[9]

Sternberg (1977) sent questionnaires to elicit information from 100 academic libraries. She received responses from sixty-four libraries. Instructional materials were widely used to supplement tours. Thirty-three libraries had bibliographies and other short printed materials; four used texts or detailed syllabus; a miscellaneous of three transparencies, three slides, workbooks, oversized catalog cards, sound-on-slides (3M) were mentioned; two used film; two film loop; three video tape; and fourteen slide-tape tours. The use of posters and signs were limited to providing publicity.[22]

Olevnik (1977) sent surveys to 279 libraries, some 133 (48%) responded to a questionnaire which was an adaptation of the 1972 ACRL Bibliographic Task Force Report Form (ERIC, ED 072 823). In point-of-use instruction, the reporting libraries were inclined to use posters, charts, handouts, graphic displays and related materials accounting for 71.1% of the educational material used.[20]

Elliott (1977) used a random sampling of 25 libraries. All 25 at one time offered printed self-guided tours to their users. Of the 25, there was a 68% return with 84% still having their tours in-print. Fifty-three percent said they used some form of aid to supplement their tour. Of this response, most used some form of graphics (i.e. printed signs); there were two libraries that were using slide/tape presentations for point-of-use clarification; one library used video tapes.[8]

Stephens (1977) surveyed eleven libraries regarding their use of transparencies in audiovisual self-instruction programs. There was heavy use of other instructional materials; five libraries used texts and detailed syllabi, six used bibliographies and other short printed materials, nine used recorded sound tapes and five used other instructional material.[21]

SUMMARY

The reports cited in this paper were obtained from a variety of indexes: Dissertation Abstracts International, Educational Resources Information Center, Library and Information Science Abstracts, Library Literature, and various other sources. The research reports focus upon college level instruction. The related reports are predominately utilization reports covering both public school and college level instruction.

Library instruction, traditionally an integral part of academic library reference service, continues to raise difficult questions for librarians. In recognizing a demonstrated need among users for a more formalized program of library instruction, administrators are confronted with a number of considerations including potential instruction recipients, program design and format, assignment of responsibility, location of instruction, and extent of library resource commitment to library instruction for a maximum return in user competency and efficiency.

Although none of the research studies were library instruction oriented, there should be no reason to question the applicability of the findings to library instruction. The studies by Dwyer[5] (1970), Dwyer[6] (1971), Leps[16] (1979), Meena[19] (1979), and Dwyer[4] (1971), found the effectiveness of visuals compared favorably with traditional instruction but with differences insignificant at standard levels of statistical significance.

The related reports, all library instruction oriented, were dominated by the use of slides. Occasionally, there is a report which mentions posters, overhead transparencies, or maps (i.e. pathfinders). Though infrequent in number, there are articles reporting on the use of games to teach library instruction.

The article by Stevens (1973) discussed pathfinders; Browning (1975) and Elza (1975) are concerned with games; Essay (1975), Lolley (1975), Lubans (1975), Larson (1972), Hills (1974), and Stevenson (1975) write about slides/tapes.

The other papers are concerned with a broader range of audio-visual material. Fjalibrant (1976) mentions, among other things, printed guides; Harris (1978) writes about posters; and the Acacia School system[25] (1973) article discusses the use of transparencies.

The four surveys [i.e. Sternberg (1977), Olevnik (1977), Elliott (1977), and Stephens (1977)] provide a broad overview of the use of visual materials in library instruction.

CONCLUSION

The research studies do support the validity of using visual materials as instructional aids. The research of Francis M. Dwyer would appear to be a model for the prospective researcher to follow. His work is marked by organization, large numbers of participants, well-designed objectives, and conclusions marked by an objective, unemotional presentation. The findings of the research studies tend to be very positive and highly supportive of the value of visual materials in instruction. Too, these studies mark a time when none of the researchers claimed significant superiority of the audio-visual material studied over other methods, traditional or otherwise.

A review of the utilization studies indicates the acceptance by librarians of visual materials to enhance their instruction. At the same time, these papers support the conclusion that non-projected visual materials are used in ways highly supportive of other instructional methods. This is to say that the instruction load is not carried by the non-projected visual material. They are primarily aids to the instructor, whether traditional or non-traditional instruction in used.

Too, it is probably worth mentioning that visual material seems to be most heavily used in point-of-use library instruction and library tours.

The quality of visual material used for library instruction can be expected to improve and increase as instructors come to realize that media are best used when in combination with a variety of other instructional materials, supportive in purpose, and apply the instructional systems approach to the analysis and development of practical solutions to teaching and learning problems.

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